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The impact of market structure of the banking sector on the growth of bank loans in the EU after the global financial crisis

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Contents

Abstract

The aim of this research is to investigate the issue of asymmetry of the credit market determinants of bank loans (corporate, consumer, and residential mortgage loans) between the CEE-11 countries (Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Rumania) and the other countries (Austria, Belgium, Denmark, Finland, France, Greece, Italy, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden, United Kingdom, Malta, and Cyprus) after the global financial crisis (GFC) of 2007–09. For the analysis, we used annual bank-level data, which are collected from the Bankscope-Orbis database and interest rates for different loans from the European Central Bank and macroeconomic data on GDP growth. Panel data includes commercial banks, savings banks, and cooperative banks that were operating in the EU countries from the period 2010–2016.

Using the methodology of panel regression, this study finds differences of the determinants of the growth of loans for two groups of countries after the global financial crisis. Panel data analysis of CEE-11 countries against other EU countries also finds differences between determinants of different types of bank loans.

Keywords: banks, credit growth, concentration, foreign ownership, EU, CEE-11.

JEL: F36; G2; G21; G34; L1.

Introduction

The experience of the global financial crisis (GFC) of 2007–09 and its aftermath reinforced the importance of the macro-prudential policy to keep economies of EU countries on the path of sustainable long-term economic growth. Policymakers have increasingly focused on the need to strengthen macro-prudential frameworks to ensure the stability of the financial system, both nationally and globally (Borio et al., 2015). The size and condition of the banking sector affect systemic risk (Laeven et al., 2016). Therefore, a number of questions need to be addressed to develop the banking sector's and potential contribution to sustainable grow of the economy. However, it should be noted that the banking sectors of the EU countries are not homogeneous (Pawłowska, 2016). We can see a clear difference in the value of assets of the so-called old and new EU member states, EU-12 (Cyprus, Czech Republic, Estonia, Lithuania, Latvia, Malta, Poland, Slovakia, Slovenia, Hungary, Bulgaria, Rumania), and the countries of the so-called old union, EU-15 (Austria, Belgium, Denmark, Finland, France, Greece, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden, United Kingdom, and Italy) (see Fig. 3 in Appendix 1). The assets of the banking sector are mainly loans. In principle, the availability of loans depends on the supply, namely the capacity and readiness of banks to grant them. Bank loans in the EU are the most important source of external funding not only for households, but also for businesses, and they play a significant role in shaping the changes in business activity and in transmitting monetary policy impulses to the real economy. The global financial crisis has shown that credit growth caused deepening of the imbalances present between development of the financial markets and economic development; the consequences of the crisis were more pronounced in countries where home-loan booms occurred.

Before the financial crisis, robust growth of credit to the private sector, associated with the so-called catching-up process, was also observed in EU-12 countries. This growth was particularly strong in the Baltic states (i.e., Lithuania, Latvia, and Estonia), whereas it was significantly weaker in Poland, especially in terms of corporate credit (see Fig. 5-8 in Appendix 1). It should be noted that most of the EU-12 member states (except for Malta and Cyprus) are post-communist countries

and have been playing the role of host country for banks from a number of countries in Europe. Parent financial institutions of those banks were located mostly in Western Europe (Austria, Belgium, Greece, Germany, France, Italy, Netherlands, Portugal, and Spain) (Pawłowska, 2016).

Loans are the main banking product used to finance the real economy. They are also the determinants of stability of the financial sector because problems with servicing bank loans (by enterprises and households) often underlie a systemic crisis (Cecchetti et al., 2011). Furthermore, financing by loans plays an important role in economic development. Research concerning the determinants of credit demand and supply has become a key topic in many economic publications, but the operational goals of researchers can vary. Some authors aim at providing very general information about the influence of demand-side and supply-side variables on credit growth. Others investigate the monetary transmission channels, for example, in Poland (Hurlin & Kierzenkowski, 2007).

The aim of this research is to investigate the issue of asymmetry of the credit market determinants of various bank loans between the Central and Eastern European countries (CEE-11) and the other EU countries after the GFC. Specifically, we compare the credit market determinants of loans among the CEE-11 countries (the Czech Republic, Estonia, Lithuania, Latvia, Poland, Slovakia, Slovenia, Hungary, Bulgaria, Rumania, Croatia) and the determinants among the EU-17 countries (Austria, Belgium, Denmark, Finland, France, Greece, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden, United Kingdom, Italy, Malta, and Cyprus). Besides the empirical analysis of determinants of various bank loans— household loans (mortgage loans and consumer loans), corporate loans, and total loans—the purpose of the paper is to carry out a comparative analysis of the credit market of the CEE-11 countries against all EU-28 states, based on the experience of the financial crisis and the ongoing European debt crisis. Given the feedback between the real sector and the financial sector, this paper also analyzes the effect of the determinants of the results of banks based on the micro data concerning banks' performance. The determinants of banks' performance include banking sector

profitability, capitalization, concentration in the banking sector (indicators CR5 and HHI)[1], and share of foreign banks.

The major contribution of this study to the literature is to find the differences of the credit market determinants for different types of loans (corporate, consumer, and residential mortgage loans) between the CEE-11 countries and the other EU countries after the GFC.

This study consists of three parts and a summary. The first part is a broad literature review concerning the link between market structure, foreign banks and lending. The second part presents data and empirical models. The third part presents the results of the analysis based on the panel data. The summary provides the conclusions that we made.

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[1] The share of the five largest banks' total assets (CR5); the Herfindahl-Hirschman index for assets (the sum of the squares of the market share of individual banks (HHI).

1. Motivation and Existing Literature

The years before the GFC were a period of rapid change within the EU banking sector; the ownership structure changed and the consolidation processes intensified. Since the late 1990s, CEE countries have been playing the role of host countries for banks from a number of countries in Western Europe. However, it should be noted that the consolidation processes in the CEE banking sector were to a great extent a natural consequence of earlier privatization of domestic banks and attraction of strategic investors for those banks, as well as the fact that an increasing number of mergers took place within euro zone countries.

The consolidation in the CEE countries' banking sectors led to changes in concentration measured with CR5 ratios. An important feature of the banking sectors of CEE countries was a high level of concentration and foreign presence (Arena et al., 2006) as opposed to the highly developed banking sectors in the United States and Western Europe (see Fig. 1 in Appendix 1). CEE banking sectors are relatively small in comparison to the other EU sectors (see Fig. 2 in Appendix 1) and have relatively simple traditional business models. Banks concentrate their activities on lending to local companies and households.

Following the collapse of Lehman Brothers, governments bailed out many banks with capital injections while other banks were nationalized. The crisis also showed that foreign ownership could amplify the effect of a global shock on transition countries. It should be noted that after the GFC, despite the continuing process of M&As, the latter did not cause significant changes in the level of concentration and share of foreign capital in EU (with the exceptions of Greece and Ireland). Since the GFC (i.e., 2010–2016), the CEE banking sector has continued to be highly concentrated and characterized by high levels of foreign capital, whereas in the banking sectors of Western European countries the level of foreign capital is relatively low and the concentration is more diversified. Parent financial institutions of CEE banks were located mostly in the euro zone (Austria, Belgium, Greece, Germany, France, Italy, Netherlands, Portugal, and Spain) and in the United States.

The impact of foreign banks is unambiguous. On the one hand, the pre-GFC evidence suggests that foreign bank participation brought many benefits to developing

countries including financial stability (Bonin et al., 2005). On the other hand, the GFC highlights the role of multinational banks in the transmission of shocks across countries. In addition, foreign banks can be a channel through which shocks in one country are transmitted and affect the supply of credit in another country. Furthermore, foreign banks' legal structure (branch versus subsidiary) along with the nature of the banking crisis (systemic versus non-systemic) could also determine their stabilizing or destabilizing role (Adler & Cerutti, 2015).

Claessens and Van Horen (2013) found that during the GFC foreign banks reduced credit more sharply as compared to domestic banks, except when the foreign banks dominated the host banking systems. Popov and Udell (2012) found evidence of the international transmission of the crisis shock to transition countries and showed that transition country firms' access to credit during the crisis was affected by the balance sheet conditions of foreign parent banks.

Cull and Soledad Martinez Peria (2013) found that in CEE countries during the GFC, foreign loan growth fell more than that of private domestic banks and also that state-owned banks increased their loans during the crisis. Furthermore, Cull et al. (2017) found that foreign-owned banks are more efficient than domestic banks, promote competition in host banking sectors, and stabilize credit in the case of idiosyncratic shocks. However, foreign-owned banks also transmit external shocks and might not always expand credit. De Haas and van Lelyveld (2014), using worldwide data, found that parent banks were not significant sources of strength for their subsidiaries during the global crisis. Furthermore, they found evidence that government-owned banks reduced credit growth in CEE emerging economies to a lesser extent than did privately-owned banks in 2009.

Finally, Allen et al. (2017) examined the interactions of bank lending dynamics with domestic, foreign, and global crises along with changes in ownership in the CEE banking sector. They found the impact of ownership structure on banks' lending activities in the CEE was conditional upon the type of crisis. Furthermore, they argue that deposit growth and profitability ratios are significant for credit growth during both normal economic times and crisis periods, regardless of the crisis type. Meriläinen (2016) examines lending growth in Western European banks over the

2004–2013. The results suggest that both the financial crisis and the sovereign debt crisis caused a nega-tive shock in Western European lending growth. However, different loan types (e.g., commercial or residential loans) were not included in this study.

Pawłowska (2016) describes the important role of size and market structure in EU banks. Empirical results based on panel data covering the period of 2004–2012 show that the banking sectors within the EU are not homogeneous and also, that there is asymmetry between the performance of the EU-15 and EU-12 banking sectors. The effect of size and competition on financial stability for EU-15 banks (i.e., large banking sectors) differs from EU-12 banks (i.e., small banking sectors). Generally, size had a negative impact on financial stability within the EU banking sectors. However, those effects are only significant within the EU-12 banking sectors.

To sum up the above considerations, it can be concluded that the empirical studies in this area have focused on the impact of increased participation of foreign banks and concentration on bank loans in emerging markets. These studies have raised questions about the foreign banks' potentially stabilizing or destabilizing role during times of financial distress. Therefore, in this study, we decided to split the research sample of EU countries into two groups (CEE-11 countries and EU-17 countries): host countries and home countries.

The major contribution of this study to the literature is to find an asymmetry of the credit market determinants between the CEE-11 and the other EU countries after the global financial crisis. Panel data analysis of the credit market of the CEE-11 countries against other EU countries also finds differences between determinants of different types of bank loans. This study is the first comprehensive study on determinants of different loan types during the crisis and fills a gap in the literature of the subject.

2. Data and Models Specification

In case to estimate the credit market determinants of various bank loans in EU countries (corporate, consumer, residential mortgage loans and total loans), we take annual bank-level data which are collected from the Bankscope-Orbis database and macroeconomic data on the growth of GDP from ECB. The (unbalanced) panel includes commercial banks, savings banks and cooperative banks that were operating in CEE-11 countries and the other countries of EU over the period 2010-2016. The other countries EU-17 (Austria, Belgium, Denmark, Finland, France, Greece, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden, United Kingdom, Italy, Malta and Cyprus) i.e. EU-15 extended by Cyprus and Malta. The countries CEE-11 are (the Czech Republic, Estonia, Lithuania, Latvia, Poland, Slovakia, Slovenia, Hungary, Bulgaria, Rumania, Croatia), i.e. EU-12 decreased by Cyprus and Malta and extended by Croatia. After reviewing the data for errors, we are left with 16,234 bank-year observations the period 2010-2016.

Because the share of foreign capital and concentration are strongly correlated, they are included in the separate models. Therefore, we estimated two models: the *first model* examines the impact of *market structure* measures on credit growth and the *second model* examines the impact of *foreign presence* on credit growth. Foreign-owned banks are identified as those with 50% of their shares owned by foreigners.

Firstly, we investigated the impact of *market structure* measures on credit growth based on tree panel data sets: Panel A: includes the EU-17 banks, Panel B: includes the CEE-11 banks and Panel C: includes all EU banks.

The first model was calculated as follows based on equation (1):

$$\Delta Loans_{itc} = \alpha + \varphi^* \ \Delta Lonas_{i,c,t-1} + \mu^* market \ structure_{t-1,c} + \sum_{j=1}^{N} \beta_{j^*}Bank\text{-}Specific$$

$$Variables_{itc} + \lambda_1^* macro \ variables_{t-1c} + \lambda_2 \Delta i_{t-1c} + \varepsilon_{itc} \tag{1}$$

where the dependent variable $\Delta Loans_{itc}$ is the annual change in the stock of total gross loans (in logs) to particular sector (residential mortgage loans, corporate,

consumer, and total loans) for each bank *i* and for each year *t*. Loans are express in euro.

Market structure and the development of the banking sector have an impact on the credit growth. There are two opposite hypothesis. According to the ESH, concentrated markets are those where highly effective banks operate. According to the ESH theory, more efficient banks have lower operating costs and therefore achieve higher profits. In addition, the ESH theory assumes that if a bank is more efficient than other competitors, it must choose between two mutually exclusive strategies. The first strategy concerns the maximisation of profit for shareholders by maintaining existing prices and the bank's size. According to the other strategy, profit maximisation consists in price reduction, thus in increasing the banks' market share by M&As leads to an increase in credit. Hicks (1935) developed a theory opposite to the ESH, and it is known in literature as the quiet life hypothesis (QLH). According to the QLH, firms with superior market strength and thus a privileged position suffer a lower cost efficiency due to the quiet life of their managers. Consider the above justification *market structure* is defined as follows:

As *market structure* measures we use:

- the concentration of the banking sector which was defined as a share of the 5 largest credit institutions in total assets as the concentration ratio $CR5_{tc}$ and the Herfindahl-Hirschman index for assets (the sum of the squares of the market share of individual banks HHI_{tc}) for each year *t* in country c^2.

In regressions, we also used control variables denote the bank performance as *Bank-Specific Variables$_{itc}$*:

- the ratio of total net loans to total deposit (*netloanstodep$_{itc}$*) for each bank *i* for each year *t* in country *c*.
- the *tier1 r*atio (core-capital to risk-weighted assets, *tier1$_{itc}$*) as an indicator of a bank's risk behavior (the higher the capital ratio, the greater the risk aversion) for each bank *i* for each year *t* in country *c*.

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[2] For robustness check in the regressions, also the HHI index were estimated.

- the bank profitability ratio denotes: the return on assets ratio $ROA_{itc,}$ and also the return on equity (ROE) for each bank i and for each year t in country c [3].

As the *Bank-Specific Variables* we also use the "size" of each banks, which was defined as follows:

- The log of total assets (la_{itc}) for each bank i for each year t in country c.

Also, as the "size" of each banks we use measure of relative market power which was defined as follows:

- The share of bank assets in the total assets (mp_{itc}) for each bank i and each year t in country c [4].

Cyclical factors significantly influence the growth of credit. Also, interest rates are one of the main factors influencing cost of credit, as well as they have an impact on creditworthiness of households and businesses, and their credit availability. The interest rate cycle is closely positively correlated with the economic cycle. Also, supply and demand for the consumer credit increase during the period of decreeing in unemployment rate which is conducive to higher creditworthiness of households (lower credit margins) and higher expectations regarding future income (see e.g. Leamer (2007). Therefore, the model also tests the effect of the macroeconomic situations on bank loans (corporate, consumer, residential mortgage loans and total loans). The macro variables are defined as follows:

- GDP_{tc} growth (yoy) for each year t in country c, as the effect of the business cycle on bank loans (see Fig. 4 in Appendix 1).

- Δi_{tc} - the annual changes in interest rates ($irhome_{tc}, ircons_{tc}, ircorpo_{tc}, igross_{tc}$) for different types of loans (mortgage loans, consumer loans, corporate loans and for total loans [5]) for each year t in country c, as the effect of the price of the credit.

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[3] To determine the robustness, additional estimations were calculated with the return on equity (ROE) for each banking sector i for each year t in country $c,$ as a dependent variable without core capital ratio due to correlation (see also, Pawłowska, 2016).

[4] Regressions for variable mp_{itc} are provide for robustness check and these results are not present in this paper.

[5] Weighted average interest rates for particular types of loans: mortgage loans, consumer loans, corporate loans.

The variable α is a constant term, ε_{itc} denotes the error in the model, and φ, μ, λ, a_3, and b_j are the regression coefficients.

Secondly, we investigated the impact of foreign presence on credit growth but we also control for size market power and other *Bank-Specific Variables* based on tree panel data sets: Panel A: includes the EU-17 banks, Panel B: includes the CEE-11 banks and Panel C: includes all EU-28 banks.

The second model examines the impact of *foreign presence* on credit growth follows equation (2):

$$\Delta Loans_{itc} = \alpha \; + \; \varphi * \Delta Lonas_{i,c,t-1} \; + \; \mu * \text{foreign presence}_{t-1,c} + \sum_{j=1}^{N} \beta_j * \text{Bank-Specific}$$

$$\text{Variables}_{itc} + \lambda_1 * \text{macro variables}_{t-1c} + \lambda_2 \; \Delta i_{t-1c} + \varepsilon_{itc} \qquad (2)$$

where the dependent variable $\Delta Loans_{itc}$ is the annual change in the stock of total gross loans (in logs) to particular sector (residential mortgage loans, corporate, consumer, and total loans) for each bank *i* and for each year *t*. Loans are express in euro.

In the second model, all explanatory variables are defined in the same way as in the first model. Only, instead of variables denote concentration there have been defined variables constituting the presence of foreign banks (*foreign presence $_{t-1,c}$*). The literature concerning foreign banks can be divided into two groups: concerning industrial and emerging markets. When studying foreign banks in transition and developing countries, many studies find that foreign banks perform better than domestic banks (Degryse and Ongena (2008), Havrylchyk and Jurzyk (2011). However, in the transition period began in the mid-1990s, foreign bank entry was a catalyst for change. In this view, the rapid transition of the banking sector can be attributed to foreign owners who brought modern technology, market oriented decision making, independence from vested interests and competition (Bonin et. al., 2005; Bonin and Wachtel, 1999, Haselmann et. al. 2016). Furthermore, foreign banks' legal structure (branch versus subsidiary) along with the nature of the banking crisis (systemic versus non-systemic) could also determine their stabilizing or destabilizing

role. Claessens and Van Horen (2013), found that during the global financial crisis of 2008, foreign banks reduced credit more sharply when compared to domestic banks, except when they dominated the host banking systems.

The presence of foreign banks is defined following Claessens and Van Horen (2014) who constructs two indices. The first index is defined as the percentage of foreign bank assets among total bank assets (as the percentage of foreign banks among total banks) in a country (*foreign presence 1*) :

sfb$_{tc}$ - is defined as the percentage of foreign banks among total banks in each year *t* in country *c*.

The second is defined as the percentage of foreign banks among total banks in a country (*foreign presence 2)* :

numfb$_{tc}$ - is defined as the percentage of foreign banks among total banks in each year *t* in country *c*.

These variables are strongly correlated in two groups of countries (see cf., Figure 2 in the Appendix 1). Therefore, the separate regressions for these two variables were performed based on the second model.

3. Results of Panel Data Analysis

In order to carry out the investigation of the issue of asymmetry of the credit market determinants of various bank loans between the CEE-11 countries and the EU-17 countries, after the global financial crisis we provided panel data estimations. Tables A1, A2, A3 of the statistical Appendix present the summary statistics of key selected variables. Tables A8, A9, A10 present the correlation coefficients between of key selected variables. The correlation coefficients are estimated for a sample of the EU-17 countries and CEE-11 and for all EU-28 across the period 2010–2016.

For estimations of two models we used a system GMM, *two-step robust* estimator (xtabond2) (Arellano and Bover (1995), Blundell and Bond (1998) Windmeijer (2005). We used several tests proposed by Arellano and Bond (1991) and Arellano and Bover (1995). We used also the Hansen of over-identifying restrictions, which tests the overall strength of the instruments for a two-step estimator (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998).

In case to investigate the asymmetry of the credit market determinants between the CEE-11 countries and the EU-17, we performed two estimations for two models separately to avoid any alignment of variables: market structure (*CR5* and *HHI*) and foreign presence *(sfb, numfb[6])*. A total of 25 regressions analyzes were performed for each group of countries based on two models: based on equation (1) and based on equation (2).

Tables A4-A7 of the statistical Appendix present the results of regressions using a two-step robust GMM estimator for three groups of countries. For each of the estimations, we also reported the Hansen test results at the bottom of the table as well as the Arellano-Bond tests (AR(1) and AR(2)). The model seemed to fit the panel data reasonably well, as the Hansen-test showed no evidence of over-identifying restrictions. Tables A4-A7 present the results of regressions for three groups of countries respectively for: mortgage loans, consumers loans, corporate loans and total loans.

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[6]Regressions for the second model for variable *foreign presence 2 (numfb)* are provide for robustness check and these results are not present in this paper.

In Table A4 of the Appendix 2 a positive and significant coefficient (μ_2) was found for the first model for EU – 17. It means that concertation — measured in terms of the share of the five largest banks' total assets (*CR5*)—had a positive and significant influence on the grow of mortgage loans in EU 17countries. Also, in Table A4 of the Appendix a positive and significant coefficient (μ_2) was found for the second model for CEE – 11. It means that *foreign presence* (1)—measured in terms of the percentage of foreign banks among total banks (*sfb*)—had a positive and significant influence on the grow of mortgage loans in 11 CEE countries. In Table A7 of the Appendix a positive and significant coefficient (μ_2) was found for the first model for EU – 17. It means that concertation—measured by Herfindahl index (*HHI*)—had a positive and significant influence on the growth of total loans in EU – 17.

In the next step we measured, whether the economic growth has impact on the credit growth of different type of loans. In Table A5 of the Appendix a positive and significant coefficient λ_1 was found for the first and second model for EU – 17 for the GDP growth (*GDP*). It means that consumer loans are strongly pro-cyclical. Also, in Table A7 of the Appendix a positive and significant coefficient λ_1 was found for the first and second model for the growth of total gross loans for EU – 28. On the other hand, in Table A6 of the Appendix a negative and significant coefficient λ_1 was found for the first and second model for EU – 17 for the GDP growth (*GDP*) for corporate loans.

Finally, the bank "size" — measured in terms of the individual institution's the log of total assets (*la*) — influenced negatively on the growth of corporate loans for EU-17 countries. This results may confirm the size of individual banks is important for growth of corporate loans. Also, capitalization had positive impact on the growth of mortgage loans and total loans in EU-17 (see: table A4 and A7 of the Appendix 2).

The all above results obtained on the basis of two econometric models allowed to formulate the following conclusions.

The relationship between bank concentration and growth of mortgage loans is mainly positive for EU-17 countries, but only in case of using the measure CR5. Also, the relationship between bank concentration and growth of total loans is mainly positive for EU-17 countries.

The presence of foreign banks has a positive effect on the growth of mortgage loans for EU-17 countries. Bank size has a negative effect on the growth of corporate loans in EU-17 countries.

The relationship between the growth of GDP and the growth of consumer loans is positive mainly for CEE-11 transition countries. The relationship between the growth of GDP and the growth of corporate loans is negative mainly for all EU-17 countries.

This study showed different determinants of the growth of various types of loans for two groups of countries (CEE-11 countries and the EU-17 countries), after the global financial crisis. However, the results of this research did not give any definite conclusions as to the role of foreign capital participation, the results showed rather the impact of the size of banks and bank's concentration on growth of loans. On the one hand, Cull et al. (2017) found that in Eastern Europe, there are no robust significant differences in foreign banks consumer loan growth relative to domestic banks, both before and during the crisis. On the other hand, many reports highlight the problem of low growth in corporate loans in the euro area countries (Bank of Finland Bulletin, (2016). Therefore, it seems that the obtained results, require further more comprehensive analysis of these determinants for particular types of loans with using other econometric models.

Conclusions

This paper investigates the issue of asymmetry of the credit market determinants of bank loans (corporate, consumer, and residential mortgage loans) between the CEE-11 countries (the Czech Republic, Estonia, Lithuania, Latvia, Poland, Slovakia, Slovenia, Hungary, Bulgaria, Rumania, Croatia) and the EU-17 countries (Austria, Belgium, Denmark, Finland, France, Greece, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden, United Kingdom, Italy, Malta and Cyprus) after the Global Financial Crisis (GFC).

The determinates of banks loans included concentration indicators and foreign ownership presence. Comparative analysis of the credit market of the CEE-11 countries against all EU-28 and EU-17 also find the differences between determinants of different type of loans.

Using the methodology of panel regression, this study finds that the relationship between bank concentration and growth of mortgage loans is mainly positive for EU-17 countries, but only in case of using the measure CR5. The presence of foreign banks has a positive effect on the growth of mortgage loans for EU-17 countries. Bank size has a negative effect on the growth of corporate loans in EU-17 countries. Also, capitalization had positive impact on the growth of mortgage loans and total loans in EU-17.

The relationship between the growth of GDP and the growth of consumer loans is positive mainly for CEE-11 transition countries. The relationship between the growth of GDP and the growth of corporate loans is negative mainly for all EU-17 countries.

This paper provides valuable insights for banking supervisors about the impact of market structure on the credit grow. A further direction of research it should be a deeper interpretation of the obtained results. In particular, this issue concerns corporate loans which growing so slowly, particularly in develop EU-17 countries.

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Appendix 1
Figure **1.** Banking Concentration and Foreign Presence for EU-28 in 2015 (%)
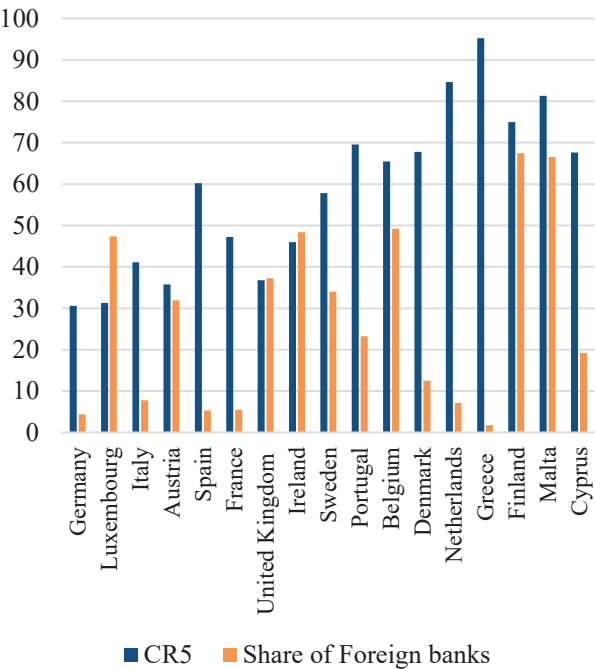
A: **EU-17**   B: **CEE-11**
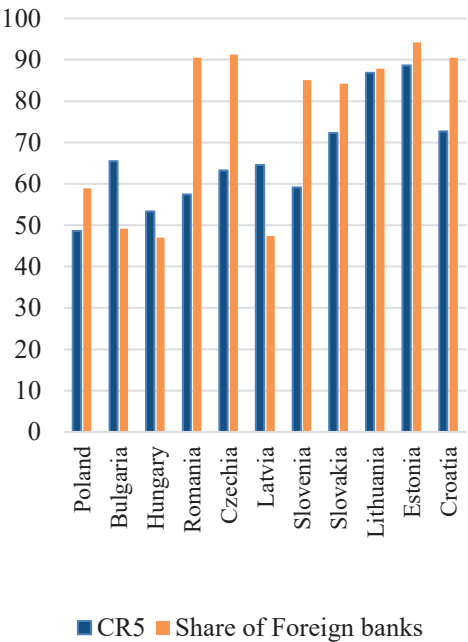
Source: own calculations on the basis of ECB data.

Figure **2.** Foreign Bank Presence Variables in EU- (2015)
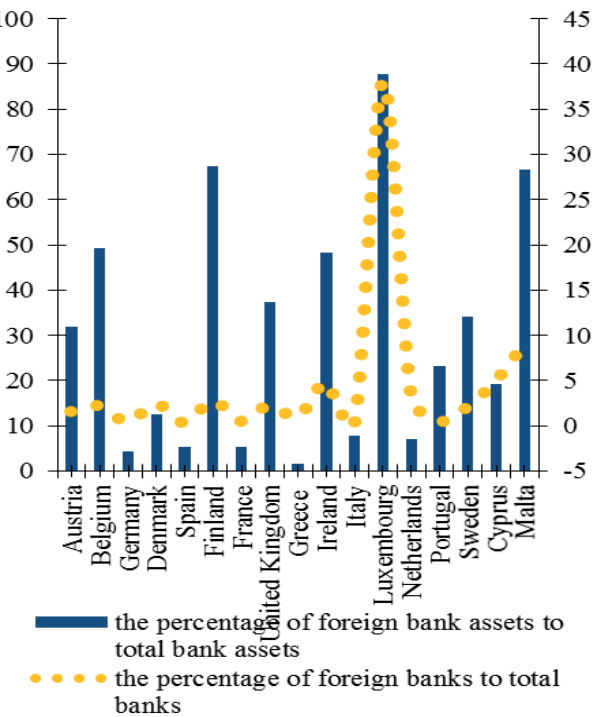
A: **EU-17**   B: **CEE-11**
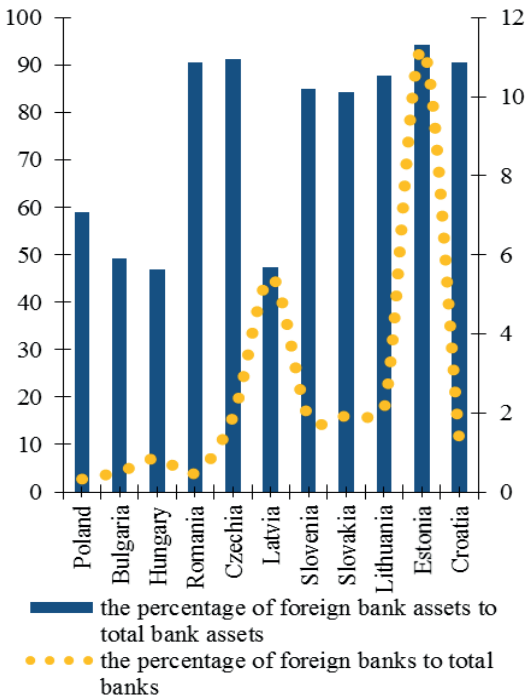
Source: ECB and own calculation.

Figure **3.** Assets of the Banking Sectors in the years 2011, 2015 (in EUR billion)

A: **EU-17**
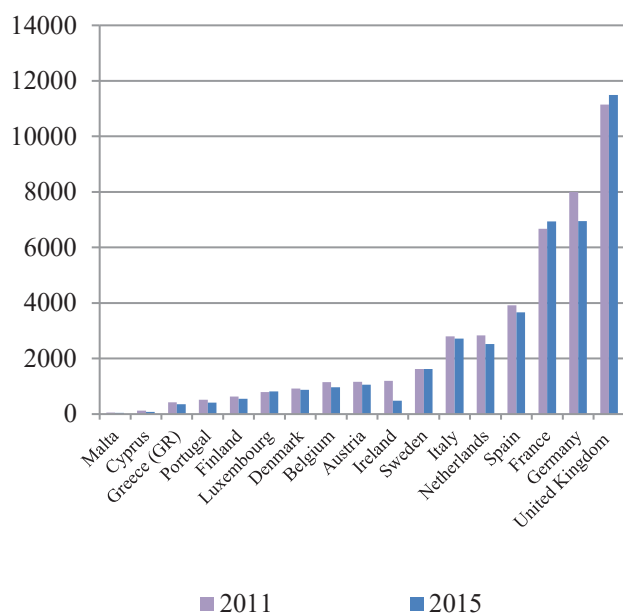
B: **CEE-11**
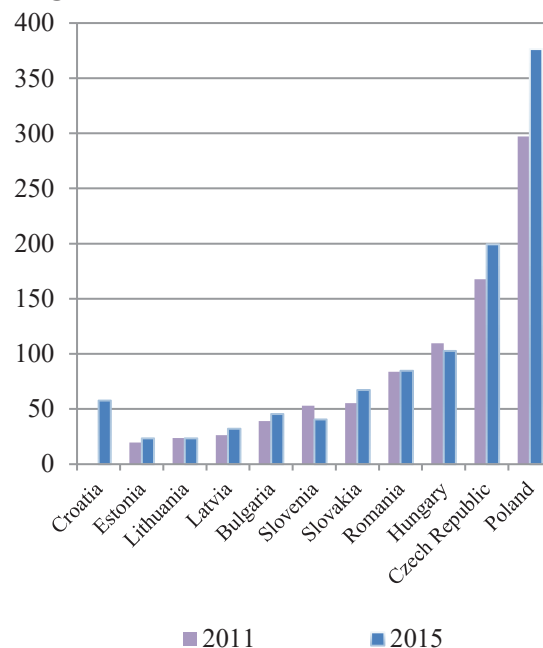
Source: ECB.

Figure **4.** GDP growth (yoy) in EU-28

A: **EU-17**
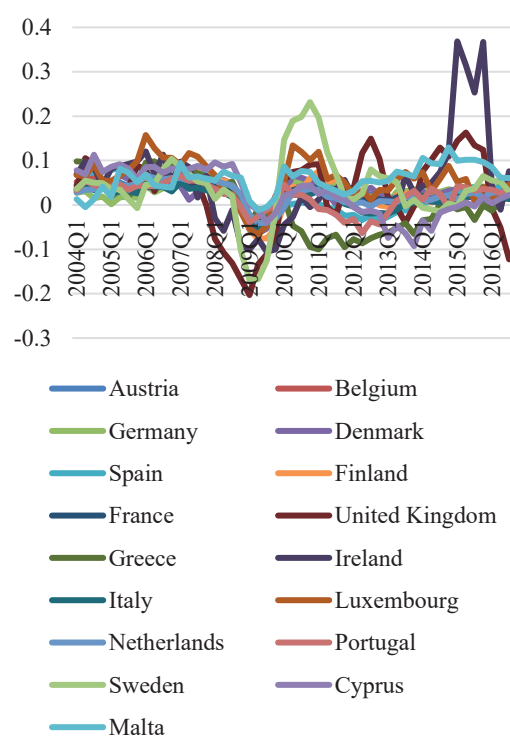
B: **CEE-11**
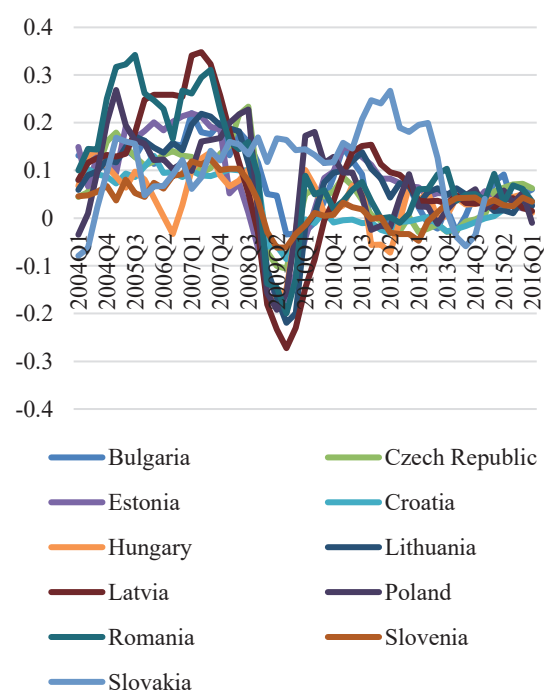
Source: ECB, Eurostat and own calculation.

Figure **5.** Credit growth for the non-financial sector in Germany [%]
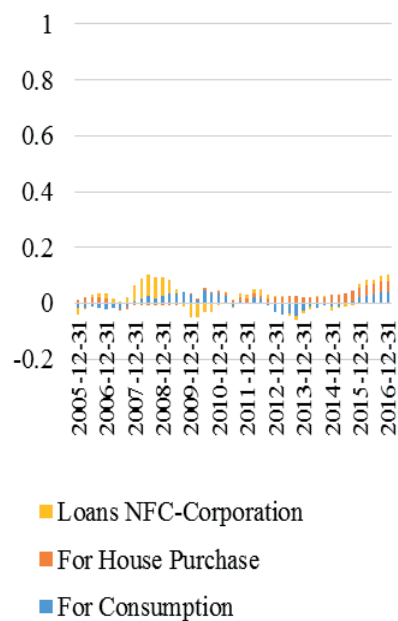
Figure **6.** Credit growth for the non-financial sector in Ireland [%]
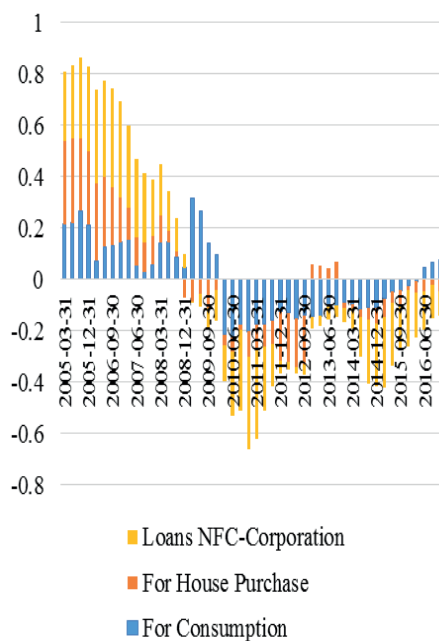
Figure **7.** Credit growth for the non-financial sector in Poland [%]
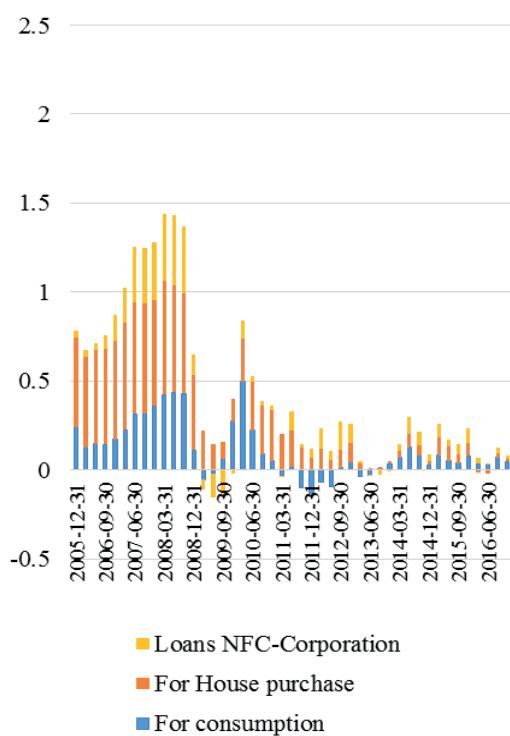
Figure **8.** Credit growth for the non-financial sector in Lithuania [%]
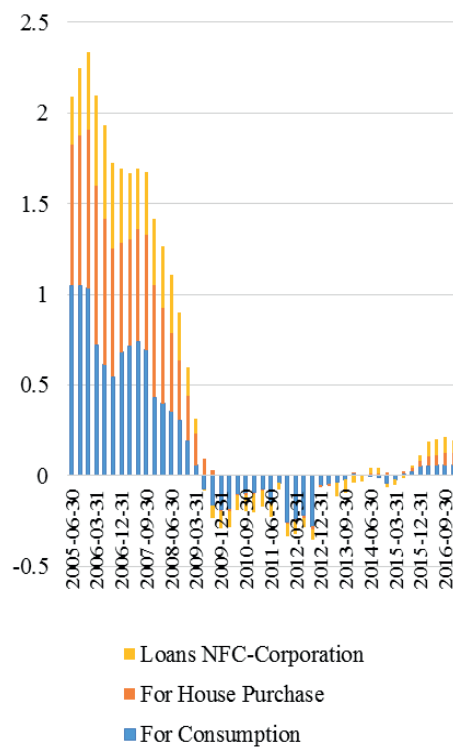
Source: ECB and own calculation.

Appendix 2

Table A1: Summary Statistics on the Characteristics of EU-28 banking sectors structure and balance sheet data

This table provides summary statistics (mean and standard deviation (SD)) for all variables in the model. Data are observed yearly from 2010-2016.

```
Variable     |     Obs      Mean       SD        Min       Max
-------------+-------------------------------------------------
 grossloans  |   16,225   12.8496   2.561438        0    20.8997

mortgageloans|    6,498   12.37496  2.525792  0.693147  19.8758

consumerloans|    3,069   11.96608  3.501184        0   19.13684

corporateloans|   2,741   12.73196  3.126945        0   19.92912
-------------+-------------------------------------------------
 tier1ratio  |    9,769   18.15445  22.6633       -6.7     29.15

        ROA  |   16,224   .4541081  4.204196   -316.32     81.28

        ROE  |   16,187   3.795346  26.14891   -977.88    979.76

netloanstodep|   15,854   79.34044  67.3338          0    991.15

         mp  |   16,234   .0202471  0.351328   4.35e-10  26.31394

         la  |   16,234   13.59864  2.342427    1.6094   21.54054
-------------+-------------------------------------------------
      numbf  |   16,234   1.660833  5.01035    .30596    39.11846

        sfb  |   16,234   19.26161  20.73132      1.73    96.4045

        HHI  |   16,234   .0535099  .0416644     0.026      0.37

        CR5  |   16,234   42.01305  13.16924   30.5627     95.23
-------------+-------------------------------------------------
     irhome  |   17,652   3.275844  0.953517    1.0694   11.06207

    ircorpol |   16,234   3.05943   1.050786    1.2805   10.2483

      ircons |   16,234   5.253842   1.72753    2.7528   17.2628

     igross* |   16,234   4.191992  1.125719    2.2235   11.9380
-------------+-------------------------------------------------
        GDP  |   16,234   0.5619    1.555    -0.0927487    25.67
-------------+-------------------------------------------------
```

Source: own calculations on the basis of ECB, IMF, World Bank, Eurostat data.

Note: *Weighted average interest rates for particular types of loans: mortgage loans, consumer loans, corporate loans.

Table A2: Summary Statistics on the Characteristics of CEE-11 banking sectors structure and balance sheet data

This table provides summary statistics (mean and standard deviation (SD)) for all variables in the model. Data are observed yearly from 2010-2016.

Variable	Obs	Mean	SD	Min	Max
grossloans	951	13.41871	2.21797	2.07944	17.6667
mortgageloans	325	12.25133	2.74329	2.197225	16.95164
consumerloans	654	12.07967	2.690688	1.7917	16.81808
corporateloans	650	12.73285	2.054634	3.2958	16.72919
tier1ratio	441	18.9059	11.87794	0.43	79.19
ROA	990	-.2573131	10.9865	-316.32	30.29
ROE	988	-1.083684	59.8896	-924.94	423.08
netloanstodep	905	78.75548	62.43695	0	766.03
mp	990	0.058676	0.137793	3.36e-06	2.06288
la	990	14.1481	1.869408	6.8002	18.94501
numbf	951	1.608761	1.89557	0.32743	10.81081
sfb	951	74.87881	19.6526	6.9153	96.4045
HHI	951	0.10336	0.04063	0.0563	0.2613
CR5	951	60.76228	11.3824	43.6871	90.635
irhome	870	4.818545	2.217799	1.64927	11.06207
ircorpo	951	4.584301	1.765333	2.1822	10.2483
ircons	951	9.711409	4.104202	2.7528	17.2628
igross*	870	7.40698	2.233889	3.3699	11.93803
GDP	951	0.134401	0.31189	-.028548	1.47

Source: own calculations on the basis of ECB, IMF, World Bank, Eurostat data.
Note: * Weighted average interest rates for particular types of loans: mortgage loans, consumer loans, corporate loans.

Table A3: Summary Statistics on the Characteristics of EU-17 banking sectors structure and balance sheet data

This table provides summary statistics (mean and standard deviation (SD)) for all variables in the model. Data are observed yearly from 2010-2016.

Variable	Obs	Mean	SD	Min	Max
grossloans	15,008	12.81402	2.568627	0	20.8997
mortgageloans	6,151	12.3862	2.509513	0.69314	19.8758
consumerloans	2,369	11.9493	3.68426	0	19.1368
corporateloans	2,068	12.75316	3.377958	0	19.9291
tier1ratio	9,273	18.10758	23.1009	-6.7	729.15
ROA	15,008	0.715530	5.894054	-161.03	181.28
ROE	15,008	4.299137	27.39196	-977.88	979.76
netloanstodep	14,701	80.12099	67.8058	0	991.15
mp	15,008	.0074907	0.03559	4.35e-10	0.53781
la	15,008	13.54371	2.363692	1.60943	21.54054
numbf	15,840	0.9766168	1.033373	0.3059	13.0081
sfb	15,008	15.16516	14.36261	1.7348	79.8522
HHI	15,008	0.050900	0.040123	0.0266	0.37
CR5	15,008	40.7131	12.25161	30.562	95.23
irhome	15,008	3.214757	0.745722	1.0694	5.240008
ircorpo	15,008	2.987469	0.905433	1.2805	7.596
ircons	15,008	5.011	0.905773	3.0419	10.21875
igross*	15,008	4.048508	0.6914173	2.2235	7.949267
GDP	15,008	.5589049	1.273993	-0.09274	8.4

Source: own calculations on the basis of ECB, IMF, World Bank, Eurostat data.
Note: *Weighted average interest rates for particular types of loans: mortgage loans, consumer loans, corporate loans.

Table A4: Empirical Results of two Models: Mortgage loans

VARIABLES	EU-17 D.lmortgloans	CEE – 11 D.lmortgloans	EU-28 D.lmortgloans
LD.mortgloans	-0.23**	-0.46**	-0.25**
	(1.02214e-01)	(2.26588e-01)	(1.06432e-01)
ROE	0.03*	0.00	0.03
	(1.79358e-02)	(4.74865e-03)	(2.44450e-02)
netloanstodep	-0.06**	0.02	-0.00
	(2.45126e-02)	(1.60691e-02)	(2.13959e-02)
L.GDP	0.07**	0.41	0.09
	(3.31567e-02)	(3.38908e-01)	(6.77923e-02)
L.sfb	0.06***	0.01	0.01
	(2.21229e-02)	(2.42930e-03)	(1.05068e-02)
L.la	-0.72	-0.68	-1.74***
	(1.01372e+00)	(1.45741e+00)	(6.21643e-01)
LD.irhome	0.03	0.09	0.58*
	(7.48428e-01)	(8.94404e-02)	(3.19563e-01)
Observations	308	53	361
Number of id	162	25	187
Hansen test	0.183	0.509	0.073
AR(1)	0.336	0.447	0.374
AR(2)	0.314	0.349	0.818
	EU-17	CEE – 11	EU-28
LD.mortgloans	0.02	-0.47**	-0.16
	(1.63880e-01)	(2.02140e-01)	(1.14168e-01)
ROA	-0.28	-0.02	0.41
	(5.87130e-01)	(7.81597e-02)	(5.09159e-01)
tier1ratio	0.23**	-0.52	0.06
	(1.17929e-01)	(3.27615e-01)	(2.07742e-01)
netloanstodep	-0.06***	-0.00	-0.04
	(1.61890e-02)	(1.14453e-02)	(4.57431e-02)
L.GDP	0.08	0.41	0.09
	(5.15469e-02)	(2.47603e-01)	(8.65358e-02)
L.HHI	-3.00	35.00	-0.02
	(1.61154e+01)	(7.06800e+01)	(2.52200e+01)
LD.irhome	2.54	-0.03	0.58
	(1.81244e+00)	(5.21651e-01)	(1.17672e+00)
Observations	240	28	268
Number of id	121	18	139
Hansen test	0.899	0.649	0.715
AR(1)	0.315	0.141	0.980
AR(2)	0.942	0.388	0.659
	EU-17	CEE – 11	EU-28
LD.mortgloans	0.01	-0.65***	-0.16
	(2.41429e-01)	(9.87819e-02)	(1.40887e-01)
ROA	-0.03	0.01	0.41
	(1.70904e+00)	(7.34200e-02)	(5.90725e-01)
tier1ratio	0.21	-0.36	0.06
	(1.36910e-01)	(3.52457e-01)	(1.97151e-01)
netloanstodep	-0.06	0.00	-0.04
	(3.69875e-02)	(3.05344e-02)	(4.86631e-02)
L.GDP	0.05	0.21	0.09
	(8.71938e-02)	(2.65388e-01)	(1.07423e-01)
L.CR5	0.08***	-0.20	0.07**
	(2.31173e-02)	(5.92738e-01)	(2.99108e-02)
LD.irhome	1.18	0.25	0.58
	(3.96822e+00)	(5.42456e-01)	(1.33567e+00)
Observations	240	28	268
Number of id	121	18	139
Hansen test	0.616	0.616	0.961
AR(1)	0.500	0.119	0.732
AR(2)	0.561	0.279	0.714

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Source: own calculations.

Table A5: Empirical Results of two Models: Consumer loans

VARIABLES	EU-17 D.lconsumerloans	CEE – 11 D.lconsumerloans	EU-28 D.lconsumerloans
LD.consumerloans	-0.06	-0.18	-0.29
	(3.93394e-01)	(3.04343e-01)	(3.17357e-01)
ROE	0.14	0.04*	0.05
	(1.60940e-01)	(2.29355e-02)	(6.30720e-02)
netloanstodep	-0.08	-0.03	0.09
	(1.59522e-01)	(1.35232e-01)	(9.47725e-02)
L.GDP	0.21	2.96***	0.12
	(3.01007e-01)	(8.88906e-01)	(2.03781e-01)
L.sfb	0.67	-0.02	0.06
	(6.78809e-01)	(5.34150e-02)	(2.51903e-01)
L.la	-11.63	3.70	-1.75
	(9.08374e+00)	(3.87882e+00)	(4.12027e+00)
LD.ircons	-4.98	-1.11	-0.75
	(6.41734e+00)	(7.57268e-01)	(1.32414e+00)
Observations	360	139	499
Number of id	179	67	246
Hansen test	0.940	530	0.222
AR(1)	0.534	0.020	0.392
AR(2)	0.827	0.530	0.438
	EU-17	**CEE – 11**	**EU-28**
LD.consumerloans	-0.54**	-0.02	-0.55**
	(2.57678e-01)	(2.97935e-01)	(2.53084e-01)
ROA	-0.43	2.24	-0.22
	(2.73546e-01)	(1.87547e+00)	(5.40807e-01)
netloanstodep	0.02	0.12	0.16
	(4.94880e-02)	(9.98504e-02)	(2.02007e-01)
L.GDP	-0.06	3.19**	-0.50
	(8.36457e-02)	(1.57543e+00)	(4.08729e-01)
L.CR5	-0.05	-0.08	-0.87
	(1.09140e-01)	(3.87710e-01)	(7.37051e-01)
D.ircons	-0.29	0.17	0.15
	(9.53567e-01)	(6.99459e-01)	(2.37431e+00)
Observations	360	139	499
Number of id	179	67	246
Hansen test	0.357	0.502	0.129
AR(1)	0.746	0.953	0.938
AR(2)	0.365	0.955	0.925
	EU-17	**CEE – 11**	**EU-28**
LD.consumerloans	-0.75**	-0.06	-0.68*
	(3.07682e-01)	(3.76406e-01)	(3.70997e-01)
ROA	-0.40	2.49	-0.74
	(6.86296e-01)	(2.41038e+00)	(9.89826e-01)
netloanstodep	0.22	0.12	0.31
	(2.82448e-01)	(1.15004e-01)	(3.06207e-01)
L.GDP	-0.60	2.51**	-0.50
	(5.90073e-01)	(1.05672e+00)	(4.56786e-01)
L.HHI	-283.09	-59.72	-274.36
	(2.68411e+02)	(2.18336e+02)	(2.92636e+02)
D.ircons	-2.36	0.38	1.96
	(6.22548e+00)	(9.90283e-01)	(2.98779e+00)
Observations	360	120	480
Number of id	179	67	246
Hansen test	0.344	0.429	0.594
AR(1)	0.390	0.707	0.635
AR(2)	0.852	0.735	0.828

Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Source: own calculations.

Table A6: Empirical Results of two Models: Corporate loans

VARIABLES	EU-17 D.lcorporateloans	CEE – 11 D.lcorporateloans	EU-28 D.lcorporateloans
LD.corporateloans	-0.62*	0.07	-0.31
	(3.19966e-01)	(3.67630e-01)	(2.63924e-01)
ROE	0.00	-0.01	-0.04
	(1.60679e-02)	(7.07260e-03)	(3.52314e-02)
netloanstodep	0.05*	0.03	-0.01
	(2.54954e-02)	(1.95692e-01)	(7.05653e-02)
L.GDP	0.09	-1.33	-0.03
	(1.08317e-01)	(9.12498e-01)	(1.55964e-01)
L.sfb	0.01	0.07	0.27
	(2.79111e-02)	(5.86197e-02)	(4.05706e-01)
L.la	-2.99***	-0.49	-5.80
	(1.09416e+00)	(2.49203e+00)	(3.85112e+00)
LD.ircorpo	0.91	1.43**	1.89
	(9.95409e-01)	(6.67182e-01)	(1.68582e+00)
Observations	351	136	487
Number of id	175	66	241
Hansen test	0.344	0.429	0.594
AR(1)	0.390	0.707	0.635
AR(2)	0.852	0.735	0.828
	EU-17	**CEE – 11**	**EU-28**
LD.corporateloans	-0.23	-0.54***	-0.26
	(2.84264e-01)	(8.70331e-02)	(2.87121e-01)
tier1ratio	-0.20*	-0.05	-0.14
	(1.18986e-01)	(4.10116e-02)	(1.27336e-01)
ROA	0.24	0.05	0.40
	(2.36893e-01)	(9.53069e-02)	(2.55986e-01)
netloanstodepstfund	0.02	0.03	0.05
	(2.93113e-02)	(3.83076e-02)	(3.32648e-02)
L.GDP	-0.10	-0.11	-0.26*
	(1.06049e-01)	(2.82290e-01)	(1.52215e-01)
L.CR5	-0.18	-0.11	-0.39*
	(2.88757e-01)	(1.53148e-01)	(2.28522e-01)
LD.ircorpo	0.50	0.29	0.22
	(8.51780e-01)	(2.56049e-01)	(7.60754e-01)
Observations	229	71	300
Number of id	109	42	151
Hansen test	0.357	0.502	0.129
AR(1)	0.746	0.953	0.938
AR(2)	0.365	0.955	0.925
	EU-17	**CEE – 11**	**EU-28**
LD.corporateloans	-0.19	-0.53***	-0.16
	(2.49210e-01)	(5.15278e-02)	(2.31561e-01)
tier1ratio	-0.19**	-0.04	-0.16**
	(8.75232e-02)	(3.62208e-02)	(7.87977e-02)
ROA	0.44	0.08	0.96
	(6.03147e-01)	(7.68405e-02)	(6.32247e-01)
netloanstodepstfund	0.03	0.05	0.02
	(2.67117e-02)	(3.53174e-02)	(4.99490e-02)
L.GDP	-0.20**	-0.15	-0.05
	(8.81699e-02)	(1.24274e-01)	(1.77427e-01)
L.HHI	-4.62	-8.72	4.51
	(1.21698e+01)	(1.62958e+01)	(1.85869e+01)
LD.ircorpo	-1.25**	0.11	-0.89
	(6.25619e-01)	(1.05390e-01)	(5.77086e-01)
Observations	229	68	297
Number of id	109	42	151
Hansen test	0.940	530	0.222
AR(1)	0.534	0.020	0.392
AR(2)	0.827	0.530	0.438

Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1. Source: own calculations.

Table A7: Empirical Results of two models: Total loans

VARIABLES	EU-17 D.lgrossloans	CEE − 11 D.lgrossloans	EU-28 D.lgrossloans
LD.grossloans	-0.51*	0.07	-0.61**
	(2.79950e-01)	(3.25204e-01)	(2.58678e-01)
ROE	0.04	0.00	0.06
	(4.80083e-02)	(1.95914e-03)	(3.99167e-02)
netloanstodep	0.00	0.01	-0.00
	(1.36766e-02)	(1.89840e-02)	(9.40971e-03)
L.GDP	-0.03	0.03	-0.06
	(1.32900e-01)	(7.44755e-02)	(7.94682e-02)
L.sfb	0.10**	0.00	0.09*
	(4.20071e-02)	(6.38930e-03)	(4.95354e-02)
L.la	-2.18***	-0.26	-1.77***
	(6.15799e-01)	(5.50173e-01)	(6.37274e-01)
LD.igross	-0.13	0.03	-0.80
	(1.48882e+00)	(4.86746e-02)	(1.02248e+00)
Observations	2,401	129	2,530
Number of id	1,254	67	1,321
Hansen test	0.183	0.509	0.073
AR(1)	0.336	0.447	0.374
AR(2)	0.314	0.349	0.818
	EU-17	**CEE − 11**	**EU-28**
LD.grossloans	-0.47***	-0.58	-0.50***
	(1.62405e-01)	(6.08806e-01)	(1.38929e-01)
tier1ratio	0.13**	-0.02	0.13**
	(5.69618e-02)	(4.66995e-02)	(5.95946e-02)
ROA	0.86***	-0.01	0.68**
	(2.99752e-01)	(1.69275e-02)	(2.65909e-01)
netloanstodep	0.01	-0.00	-0.01
	(1.64458e-02)	(2.71630e-03)	(1.61698e-02)
L.GDP	0.12***	-0.05	0.16***
	(4.50476e-02)	(1.14965e-01)	(5.22925e-02)
L.HHI	61.79***	-18.71	47.91
	(1.54750e+01)	(1.97821e+01)	(3.06580e+01)
LD.igross	1.30**	0.08	1.42*
	(5.76716e-01)	(9.72535e-02)	(7.78105e-01)
Observations	1,387	76	1,463
Number of id	726	48	774
Hansen test	0.183	0.509	0.073
AR(1)	0.336	0.447	0.374
AR(2)	0.314	0.349	0.818
	EU-17	**CEE − 11**	**EU-28**
LD.grossloans	-0.37	-0.65	-0.26
	(5.69517e-01)	(7.87218e-01)	(2.11948e-01)
tier1ratio	0.08	-0.03	0.05
	(6.92307e-02)	(4.71329e-02)	(3.82798e-02)
ROA	0.60	0.00	0.22
	(1.46236e+00)	(2.02063e-02)	(2.22895e-01)
netloanstodep	-0.01	-0.00	-0.02
	(5.30211e-02)	(2.93222e-03)	(1.39352e-02)
L.GDP	0.04	-0.03	0.07*
	(1.57202e-01)	(8.72015e-02)	(4.11462e-02)
L.CR5	0.12	-0.05	-0.07
	(6.43598e-01)	(5.19892e-02)	(1.00465e-01)
D.igross	1.52	0.18	-0.62
	(5.94620e+00)	(2.32632e-01)	(1.58725e+00)
Observations	1,387	76	1,463
Number of id	726	48	774
Hansen test	0.183	0.509	0.073
AR(1)	0.336	0.447	0.374
AR(2)	0.314	0.349	0.818

Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1. Source: own calculations.

Table A8: Spearman's rank coefficients for all variables in the model for EU-28

	mortgloans	irhome	consumer	ircons	corporate	ircorpo	grossloans	tierlratio	ROA	ROE	netloanstodep	CR5	HHI	sfb
mortgloans	1.0000													
irhome	0.1144*	1.0000												
consumerloans	0.8206*	0.1327*	1.0000											
ircons	-0.4372*	0.1958*	-0.3077*	1.0000										
corporateloans	0.8118*	0.2259*	0.7954*	-0.2824*	1.0000									
ircorpo	-0.3658*	0.2796*	-0.2227*	0.6419*	-0.2036*	1.0000								
grossloans	0.9528*	0.1161*	0.8926*	-0.4343*	0.8764*	-0.3500*	1.0000							
tierlratio	-0.1512*	0.0085	-0.2165*	-0.0570	-0.2445*	-0.1285*	-0.2210*	1.0000						
ROA	-0.1828*	-0.0647	-0.1163*	-0.0045	-0.1312*	-0.1290*	-0.1735*	0.3550*	1.0000					
ROE	0.0222	-0.0387	0.0684	-0.0971*	0.0538	-0.2236*	0.0534	0.2063*	0.8418*	1.0000				
netloanstodep	0.2724*	-0.1121*	0.1611*	-0.2044*	0.1198*	-0.0993*	0.2219*	0.0585	0.0949*	0.0945*	1.0000			
CR5	-0.2958*	-0.3263*	-0.2618*	0.1735*	0.0280	-0.3175*	0.1794*	0.1220*	0.0742	0.1976*	1.0000			
HHI	-0.3132*	-0.2755*	-0.2840*	0.1803*	0.0729	-0.3353*	0.1953*	0.1056*	0.0463	0.1867*	0.9831*	1.0000		
sfb	-0.4588*	0.2498*	-0.3858*	0.4852*	-0.3694*	0.3989*	-0.5153*	0.2742*	0.1430*	-0.0389	-0.0660	0.2001*	0.2539*	1.0000
numbf	0.0773	0.0868	-0.0400	-0.1394*	0.0708	-0.2508*	0.0363	0.2857*	0.0414	0.0723	0.1078*	0.3162*	0.3696*	0.2917*
la	0.9303*	0.1081*	0.8854*	-0.4415*	0.8662*	-0.3717*	0.9893*	-0.2213*	-0.1795*	0.0535	0.1268*	-0.3425*	-0.3616*	-0.5338*
mp	0.6099*	0.2004*	0.6907*	-0.0263	0.7121*	0.0255	0.6671*	-0.0730	-0.0357	0.0778	0.1046*	0.0952*	0.1199*	-0.0504
GDP	0.1521*	0.2128*	0.1995*	0.1817*	0.2182*	0.1991*	0.1628*	-0.0895	-0.1067*	-0.0554	-0.0099	-0.1422*	-0.1098*	0.2040*

	numbf	la	mp	GDP
numbf	1.0000			
la	0.0235	1.0000		
mp	0.1767*	0.6619*	1.0000	
GDP	0.0613	0.1605*	0.2141*	1.0000

Source: own calculations.

Table A9: Spearman's rank coefficients for all variables in the model for CEE-11

	mortgloans	irhome	consumer	ircons	corporate	ircorpo	grossloans	tierlratio	ROA	ROE	netloanstodep	CR5	HHI	sfb
mortgloans	1.0000													
irhome	0.1666	1.0000												
consumerloans	0.8119*	0.2139*	1.0000											
ircons	-0.2743*	0.2884*	-0.1913*	1.0000										
corporateloans	0.8061*	0.2672*	0.8045*	-0.1793*	1.0000									
ircorpo	0.0605	0.8143*	0.0787	0.0569	0.1818*	1.0000								
grossloans	0.9240*	0.2219*	0.9079*	-0.2604*	0.9298*	0.1260	1.0000							
tierlratio	0.0358	-0.0271	-0.0863	0.2773*	0.0237	-0.1498	-0.0312	1.0000						
ROA	0.2871*	-0.0460	0.3830*	0.1374	0.4665*	-0.1422	0.4058*	0.3215*	1.0000					
ROE	0.2014*	-0.0524	0.3549*	0.1731*	0.3896*	-0.1523	0.3390*	0.2134*	0.9645*	1.0000				
netloanstodep	0.4732*	0.0078	0.3677*	-0.1782*	0.4760*	-0.0036	0.5134*	-0.0146	0.1967*	0.1017	1.0000			
CR5	-0.3726*	-0.5039*	-0.4634*	0.1534	-0.3562*	-0.5702*	-0.4310*	0.3879*	0.1230	0.0837	-0.1640	1.0000		
HHI	-0.3205*	-0.4810*	-0.4220*	0.0270	-0.2977*	-0.5833*	-0.3728*	0.3597*	0.1160	0.0684	-0.1340	0.9634*	1.0000	
sfb	-0.3396*	-0.3657*	-0.4005*	0.1261	-0.4069*	-0.2047*	-0.4076*	0.2629*	0.0179	0.0082	-0.2510*	0.5593*	0.4387*	1.0000
numbf	-0.3537*	-0.3864*	-0.4455*	0.0171	-0.3307*	-0.4895*	-0.4063*	0.2406*	0.0720	0.0421	-0.1426	0.7951*	0.8485*	0.3901*
la	0.9185*	0.2244*	0.9100*	-0.2311*	0.9111*	0.0981	0.9880*	-0.0109	0.3998*	0.3435*	0.4278*	-0.4255*	-0.3699*	-0.4143*
mp	0.6742*	0.2358*	0.6121*	-0.0242	0.7903*	0.0393	0.7429*	0.2409*	0.5414*	0.4424*	0.2537*	-0.0048	0.0398	-0.1942*
GDP	0.0796	-0.0503	0.0922	-0.2672*	0.0747	0.0438	0.1108	-0.1777*	-0.0475	-0.0269	0.0032	0.0634	0.0505	0.1005

	numbf	la	mp	GDP
numbf	1.0000			
la	-0.3913*	1.0000		
mp	0.0342	0.7631*	1.0000	
GDP	-0.0625	0.1100	0.0069	1.0000

Source: own calculations.

Table A10: Spearman's rank coefficients for all variables in the model for EU-17

	mortgloans	irhome	consumer	ircons	corporate	ircorpo	grossloans	tierlratio	ROA	ROE	netloanstodep	CR5	HHI	sfb
mortgloans	1.0000													
irhome	0.4648*	1.0000												
consumerloans	0.7890*	0.3520*	1.0000											
ircons	-0.1146*	-0.0270	-0.0268	1.0000										
corporateloans	0.8289*	0.4807*	0.7660*	-0.0678	1.0000									
ircorpo	-0.2007*	-0.0640	-0.0776	0.7080*	-0.1320*	1.0000								
grossloans	0.9477*	0.4641*	0.8734*	-0.0991	0.8959*	-0.1854*	1.0000							
tierlratio	-0.0902	-0.0044	-0.1806*	-0.2794*	-0.2287*	-0.2268*	-0.1754*	1.0000						
ROA	-0.1816*	-0.1544*	-0.1872*	-0.2655*	-0.2013*	-0.2867*	-0.2063*	0.3558*	1.0000					
ROE	-0.0195	-0.0100	-0.0302	-0.2350*	-0.0187	-0.2856*	-0.0202	0.2087*	0.8079*	1.0000				
netloanstodep	0.1620*	-0.1174*	0.0407	-0.1857*	0.0004	-0.0845	0.0632	0.0952	0.0957	0.0945	1.0000			
CR5	-0.1995*	-0.3588*	-0.1619*	0.0081	-0.1751*	-0.0342	-0.2253*	0.0896	0.0595	0.0568	0.2523*	1.0000		
HHI	-0.1961*	-0.3382*	-0.1722*	0.0146	-0.1621*	-0.0095	-0.2272*	0.1227*	0.0568	0.0414	0.2665*	0.9812*	1.0000	
sfb	-0.1016	0.0760	-0.1030	0.0293	-0.1307*	0.2027*	-0.1749*	0.2988*	0.0635	-0.0225	0.1188*	0.0133	0.0901	1.0000
numbf	0.1588*	0.4739*	0.0277	-0.1313*	0.1724*	-0.1153*	0.0913	0.3224*	0.0359	0.0658	0.1757*	0.2101*	0.3024*	0.6148*
la	0.8994*	0.4607*	0.8636*	-0.0967	0.8798*	-0.2028*	0.9798*	-0.1942*	-0.2244*	-0.0285	-0.0606	-0.2697*	-0.2743*	-0.2128*
mp	0.7322*	0.2227*	0.7726*	0.0076	0.7634*	0.0204	0.8064*	-0.1544*	-0.2258*	-0.0336	0.0709	0.1372*	0.1651*	-0.0600
GDP	0.2870*	0.2024*	0.3128*	0.1842*	0.3117*	0.1709*	0.3188*	-0.0856	-0.1672*	-0.0729	0.0089	-0.1922*	-0.1464*	0.1324*

	numbf	la	mp	GDP
numbf	1.0000			
la	0.0464	1.0000		
mp	0.2173*	0.8017*	1.0000	
GDP	0.0678	0.3194*	0.2493*	1.0000

Source: own calculations. individual bank stability measure.

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